^{12}C(γ,α),(γ,**n**),(γ,**p**) 2008Af04,2013Zi03

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. H. Kelley, J. E. Purcell and C. G. Sheu	NP A968, 71 (2017)	1-Jan-2017

1966Fu02: ^{12}C, measured photoneutron cross sections up to 37 MeV; deduced nuclear properties.
1966Lo04: ^{12}C(γ,n), measured cross sections; deduced nuclear properties.
1976Ca21: ^{12}C(γ,p) E=16.0-30.0 MeV bremsstrahlung, measured σ(E,θ), absolute σ(E). ^{12}C GDR deduced possible E2 component.
2008Af04: ^{12}C(γ,α) E_γ<40 MeV, measured cross sections.
2011Ga09: ^{12}C(γ,3α) E=9.51-11.14 MeV, measured E_α, I_α, α-α-α-coin at TUNL/HIGS. ^{12}C deduced dissociation events, $\sigma(\theta)$ for E2 transition, 2^+ state.
2013Zi03: XUNDL dataset compiled by TUNL, 2013.

Photobreakup of ^{12}C was measured at 7 energies between 9.1 and 10.7 MeV at the TUNL/HIGS facility in search of the second $J^\pi=2^+$ state of ^{12}C, which is thought to be the 2^+ member of a rotational band built upon the E_x=7.6 MeV state, the so-called Hoyle state.

The photon beams, with energy spreads of ≈300-350 keV impinged on a 100 torr CO_2(80%)+N_2(20%) scintillating gas mixture that filled an optical time projection chamber (O-TPC). Charged particles tracks from breakup events were analyzed to characterize the events. Most ^{12}C breakup events proceeded via the $^{8}Be_{g.s.}$ (i.e. ^{12}C(γ,α_0)$^{8}Be_{g.s.}\rightarrow 2\alpha$), and these events were reasonably separated from reactions on nitrogen and oxygen.

The complete angular distributions were measured for each event, and the data was analyzed to obtain the E1 and E2 amplitudes as well as the corresponding relative phase. A resonance in the E2 cross section is found. A more sophisticated analysis of the data points that rigorously treats the overlap of the γ-ray beam profile with the changing E2 cross section excitation function may yield different results in a future analysis.

^{12}C Levels

E(level)	J^π	Γ	Comments
0	0^+		
10.03×10^3‡ *11*	2^+	0.80 MeV *13*	$\Gamma_{\gamma 0}$=0.060 eV *10* (2013Zi03) E(level),Γ: From (2013Zi03).
10.31×10^3†‡		1.5† MeV	
17.47×10^3†‡ *12*		6.12† MeV *14*	
18.67×10^3†‡		3.5† MeV	
22.3×10^3#		1 MeV	E(level),Γ: From (1966Fu02,1966Lo04).
22.5×10^3@		3.2 MeV	E(level),Γ: From (1976Ca21).
23.3×10^3#		2 MeV	E(level),Γ: From (1966Fu02,1966Lo04).
24.05×10^3†‡		0.5† MeV	
25.2×10^3@		2 MeV	E(level),Γ: From (1976Ca21).
25.5×10^3#		2 MeV	E(level),Γ: From (1966Fu02,1966Lo04).
27.12×10^3†‡ *34*		4.56† MeV *14*	
27.30×10^3†‡		2.0† MeV	
29.47×10^3†‡		0.8† MeV	
32.72×10^3†‡		†	Γ: Broad.

† From (2008Af04).
‡ Reported in ^{12}C(γ,α).
# Reported in ^{12}C(γ,n). See also Table 12.17 in (1968Aj02).
@ Reported in ^{12}C(γ,p).

^{12}C(γ,α),(γ,n),(γ,p) 2008Af04,2013Zi03 (continued)

γ(^{12}C)

E_γ	E_i(level)	J_i^π	E_f	J_f^π	Comments
(10.03×10^3 *11*)	10.03×10^3	2$^+$	0	0$^+$	B(E2)(W.u.)=0.45 *8* (2013Zi03)

^{12}C(γ,α),(γ,n),(γ,p) 2008Af04,2013Zi03

Level Scheme